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LAKE ELEANOR DAM COMPLETED. ROADWAY SUPPORTED ON TALL ARCH PIERS.

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NEW YORK, MAY 22, 1920

PUBLIC WORKS



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Vol. 48

NEW YORK, MAY 22, 1920

No. 19



SEWAGE SCREENING AND PUMPING STATION, DAYTONA.
Water works tank and pumping station in the background.

Sewerage of Daytona, Florida

The sewage from maximum population of nearly 18,000 pumped at main and secondary stations by centrifugal pumps and compressed air ejectors, screened and disinfected by a plant that cost \$142,000.

Daytona, Fla., has a population of about 7,500 in summer, with 3,000 to 10,000 visitors in winter. It is sewered throughout a large part of its area, although 500 residences (mostly occupied by negroes) are served by the can system. The cans are collected by the city and the contents emptied in the woods about two miles from the occupied section; but arrangements are being made for emptying them into the sewer near the sewage treatment plant.

Although the water department furnishes about 275,000 gallons of water a day, about 900,000 gallons pass through the sewage plant after rains, and much less at other times. This is believed to be owing to poor joints in the sewers and to the discharging of roof water into them, although this is forbidden. In addition, there is more or less

hard, sulphur water used from private wells instead of the city's softened supply.

PUMPS.

The city is very flat and it is impracticable to discharge the sewers into the river by gravity. The sewer lines begin at a depth of about 5 feet and the mains fall until a depth of about 11 or 12 feet is reached, when the sewage is lifted about 6 feet and again flows by gravity. All of the sewage flows to a main pumping plant, although about half of it does not have to be lifted at secondary stations. In all there are about 21 miles of sewers from 8 inches to 24 inches in diameter, about 16 miles being of the former. An iron out-fall sewer 12 inches in diameter and 10,600 feet long carries the sewage effluent from the main

pumping station to a point in the river channel below the city. Both automatic and semi-automatic flush-tanks are used.

EJECTORS.

The secondary lifting is done by means of fourteen Shone ejectors in seven stations, the two appliances at each station being intended to operate alternately. The only trouble in operating these has been due to large pieces of old cloth, dead dogs and other large objects which occasionally find their way into the sewer. There is apparently no loss of air from the pipes that bring air to the ejectors from the compressor at the central station.

Compressed air is furnished by a compressor of the Bury Compressor Company with a capacity of 150 cubic feet per minute. Air is kept at 16 to 20 pounds in the air tank. An additional compressor has just been furnished by the Chicago Pneumatic Tool Company, but has not yet been put into service. The compressors and main pumping plant are operated by a De La Vergne oil engine of 50 horse-power, making 210 r.p.m. Use of an oil reclaimer of the same company makes it possible to use the oil repeatedly with but little loss.

SCREENING AND DISINFECTING.

On reaching the pumping station but before being pumped into the outfall sewer, the sewage passes through an R.W. screen 8 feet in diameter, with 5/64-inch slots and a solid cone. The screenings contain little foecal matter and are only slightly offensive. They are emptied at the same place as is the night soil, but it is hoped that an incinerator may be installed to burn the screenings and the city's refuse. Forty-one cans, about the size of a fairly large ash can, of screenings were removed by this screen in January and 54 in February. In the summer about 30 cans a month is the average. The cans are raised from the screen pit to the wagons by a chain block.

In addition to being screened, the sewage is disinfected by means of a Wallace & Tiernan liquid chlorine apparatus, applying 20 pounds per million gallons of sewage. This is done chiefly because of the oyster plantings in the river into which the sewage is discharged.

The clarified effluent is forced through the iron outfall by two centrifugal pumps of 2,000,000 gallons capacity each and one of 1,000,000 gallons.

Last year the expenses of the city for sewerage included \$225 for carting screenings, \$783 for chlorine, \$4,886 for sewage collection and disposal, \$783 for sterilization, \$526 for air service. For depreciation and interest on bonds, \$12,462 was charged. The collecting system was valued at about \$86,000; air equipment, \$15,750; sterilizing equipment, \$1,258, and disposal equipment, \$39,550.

Lake Eleanor Dam

The Lake Eleanor Dam in the Hetch-Hetchy water supply system for San Francisco was completed during the fiscal year ending June 30, 1919, and is briefly described in the annual report of city engineer M. M. O'Shaughnessy just issued. The purpose of the dam is to impound water to operate a hydro-electric plant of 4,000 h. p. capacity which will drive the machinery required for the construction of the main Hetch-Hetchy dam and the aqueduct tunnel, as described in articles in Public Works of March 6, page 165; March 20, page 203, and March 27, page 234.

The dam across the outlet of Lake Eleanor, 4,660 feet above sea level, is located at the site of a future higher dam, of which it will eventually form a part, when it will serve for impounding a supplementary supply to that furnished by the main dam.

In general plan, the dam is arched or pointed upstream, and has twenty arch units of 40 feet span and a straight gravity wall containing 200 feet of spillway sluices. The total length and height



DOWN STREAM VIEW OF 40-FOOT ARCH UNITS IN ELEANOR DAM NEARLY COMPLETED.

are respectively 1,260 feet and 70 feet. It was built entirely by day labor by methods described in the March 20 article. Since the publication of this article, additional photographs have been received and are here reproduced to show the general appearance of the finished structure designed with a comparatively small mass of concrete to withstand a considerable pressure head, and to show the forms and service track for concreting the multiple arches. (One of these photographs will be found on the front cover of this issue.)

\$15,000,000 Niagara Power Plan

A bill has been prepared for presentation to the New York State Legislature providing for a bond issue of \$15,000,000 that will necessitate a referendum next fall. If successful, this will enable the state to proceed with hydro-electric developments in the Niagara Gorge calculated to generate 165,000 h. p. and relieve industries in the western part of New York State. It is thus hoped to regain control of valuable privileges that have been relinquished by the Legislature since 1890, many of which have, however, remained unproductive. The program

proposed by Conservation Commissioner Pratt, provides for the restriction of diversion rights, for the limitation of diversion rights at Massena and the Little Sault on the St. Lawrence River, with ultimate developments there, and for amendments to the Constitution in carrying the development and transmission of hydro-electric power for public use that will be possible within and across state forest reserves and for state regulation of stream flow by storage reservoirs.

Hydro-Electric Plan for Dead Sea

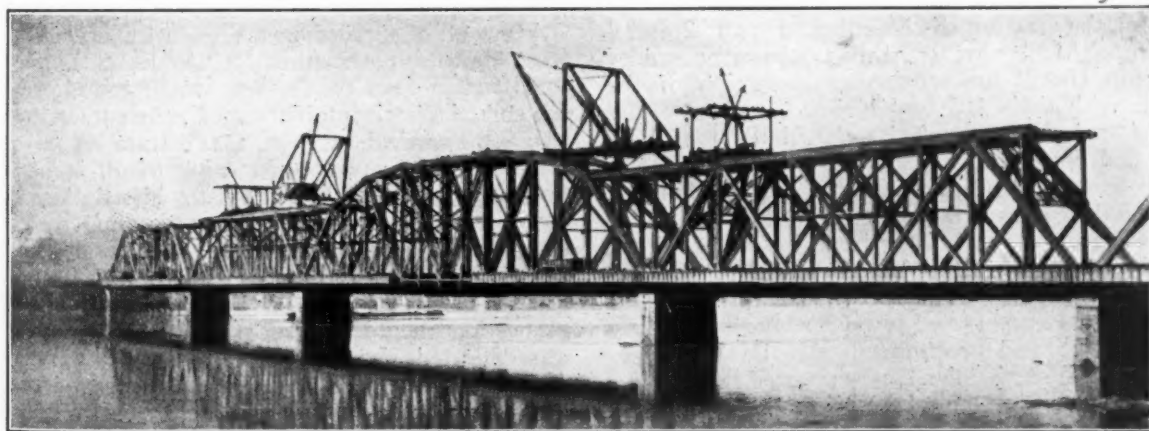
A plan to utilize the difference in level between the Mediterranean and the Dead Sea for the development of hydroelectric power has recently been brought forward. A tunnel 37 miles long from the Dead Sea valley would give a drop of 1295 feet for power generation. The power would be used for lighting and industrial purposes in the Holy Land, and to pump water from Lake Genezareth to irrigate the Jordan valley and the plain of Sharon. It is claimed that with regulating dams at Genezareth, there is enough water to irrigate several thousand acres.

Kenova Bridge Channel Span Erection

Cantilever erection of 518-foot center span outside of old span under traffic. Adjacent anchor spans moved longitudinally and heavy girder ties shortened for erection adjustments. Complicated floorbeam replacement. Center panel erection connections adjusted by jacking up ends of connected spans.

The single track superstructure of the five span bridge of the Norfolk & Western Railway Co. over the Ohio River at Kenova, West Virginia, has been replaced with a new double track superstructure, on the old substructure, without interrupting traffic. On account of the height of about 100 feet above

the water, the imminence of very high floods, the long distance to any other railroad crossing of the river, and the necessity of preventing serious interruption of traffic or navigation, the work was necessarily slow and costly and presented many difficulties that were eventually overcome by a



ERECTION OF CENTER SPAN COMPLETED. LARGE TRAVELERS RECEDING FROM THE CENTER TO BOTH ENDS AND REMOVING CANTILEVER SERVICE TRACKS AFTER REMOVING OLD SPANS.

somewhat elaborate and unusual plan of erection involving different methods for the end and intermediate spans.

The trusses for the end spans were erected on their own floor beams temporarily suspended from the old trusses while the traffic was carried on the old track supported by falsework as described in PUBLIC WORKS, April 24, page 345.

The two adjacent spans, also 298 feet long, were erected from their shore piers as full length cantilevers enclosing the corresponding old spans and finally lowered to bearing at their river ends on the channel piers as described in PUBLIC WORKS, March 27, page 237.

The erection of the 518-foot channel span was also accomplished by the cantilever method both ends, enclosing the old span, being simultaneously erected from the channel piers, 3 and 4, using the adjacent 298-foot new spans for anchorages. The trusses are 91 feet deep and 43 feet apart on centers with riveted connections at panel points excepting the four center panels of lower chords which are pin-connected eyebars. The top chords are horizontal in the four center panels and inclined at both ends; the weight of the span is 3,354 tons.

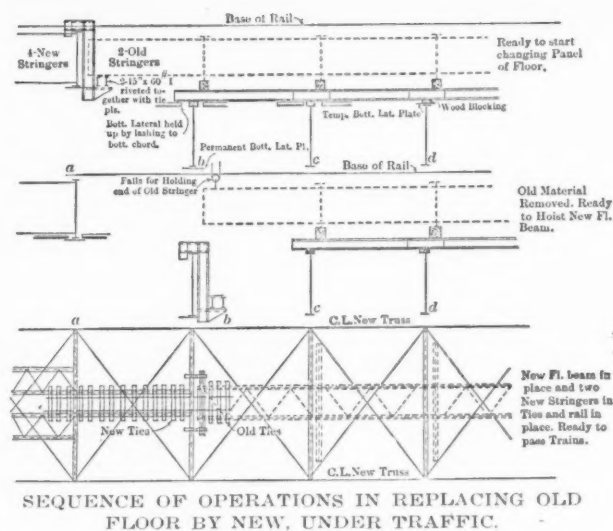
ERECTION OF TRUSSES.

The small mule travelers used for the erection of the end spans, that were illustrated and described on page 238, March 27, were placed on the top chords at the shore ends of the adjacent spans 2 and 4, where their weight was supplemented by rails also used on the erection of these spans to give additional counterweight for the anchorage of the channel span. The small travelers removed the erection ties that had connected the end and intermediate spans and portions of them were re-erected on the channel piers, 2 and 4, to serve for the anchorage of the cantilever ends of the channel span.

In order to provide for erection compression in the bottom chords and for temperature contraction, the expansion end of the span was located 6 inches south of its final position and the south end of the adjacent 298-foot span 4 had been correspondingly displaced to insure an overlap of 1 inch of the bottom chords in the center panel and facilitate final connections there.

The duplicate 212-ton overhead mule travelers used for the erection of the adjacent spans 2 and 4 were brought forward on them to the river end of their top chords and commenced erection of the trusses with their 105-foot inclined end posts that with shoe and pin attached weighed 105 tons each. Each end post was lifted by the two 65-ton booms of the traveler that for this purpose were equipped with a balance beam attached to the inclined post in such a manner as to hoist it in an inclined position. The end post was lowered until the shoe took bearing on the pier and the post was maintained in position by temporary eyebars connected to the center point and to the top of the temporary vertical posts on the pier that supported the erection tie, thus permitting the release of the derrick booms.

The truss members and other materials were delivered to the travelers on service tracks carried outside the new trusses on temporary cantilever projections from the end of the new floorbeams.



SEQUENCE OF OPERATIONS IN REPLACING OLD FLOOR BY NEW, UNDER TRAFFIC.

When the end posts were erected these tracks had been installed only as far as the channel piers and, in order to bring the floorbeams within reach of the traveler booms, track extensions were supported on two temporarily lengthened new floorbeams suspended from the end floorbeams of the old center span so that their end brackets could carry the stringers and service tracks which were later transferred to the floorbeams of the new channel span. In order to carry the excessive load of the heavy end posts and their cars, the connections of the brackets to the end floorbeams were supplemented by 3-inch horizontal tension rods connecting the brackets at both ends of the beams.

As the erection progressed the travelers advanced over the horizontal erection ties and mounted the inclined top chords of the center span. The traveler weighing 423,000 pounds was hauled up the incline by three sets of 6-sheave steel rope tackles supplemented by three sets of 4-sheave Manila rope tackles provided in case of emergency, and all anchored to the top of the old span 3. In each position of the traveler brackets were bolted to the top chords behind the traveler and the tackles were slacked off to permit the traveler to bear against the brackets which maintained it in position during service.

FINAL CONNECTION.

After all the truss members were erected and assembled there remained in the center panels of both trusses open connections in the top chords, at one end of a horizontal intermediate strut, at the top of a sub-vertical, and at the bottom of a main diagonal. There was an opening of 10 inches between the ends of the adjacent top chord pieces and the bottom chord eyebars being too long were deflected several inches from the horizontal line and were subjected to tension of about 240,000 pounds. The lower end of the main diagonal overlapped the connection about 6 inches, and as the bottom chord was deflected 45 inches downwards, the upper end of the sub-vertical was 45 inches below its final position and was held in place by a bolt moving in slots allowing for a displacement of 4 feet.

Jacking girders were attached to the shore ends of the adjacent spans and were operated to lift them and bring the open joints at the center panel

of the main span into register. During this operation, span 4 moved about 6 inches longitudinally, a displacement that had been provided for by placing the jacks on a roller carriage moving on top of the pier.

The jacking was continued after the ends of the top chords engaged until the bottom chords straightened and the sub-vertical at the center point moved upwards until the connection at the top could be made as well as the connection at the bottom of the main diagonal and at the ends of the center longitudinal strut.

Jacking was continued until the stresses began to reverse and eventually all tension was eliminated from the erection ties and all three spans were acting independently. This operation took about



MAKING FINAL CONNECTION IN CENTER PANEL OF TOP CHORD.

7 hours and involved a total jacking of about 45 inches. After the main span adjustments were completed, the adjacent spans were lowered to their final positions on the piers and traffic was resumed after an interruption of 11 hours.

Longitudinal I-beams were placed on top of the floorbeams of the new span, the old span was wedged to bearing on them and the old trusses and old bracing were removed.

SHIFTING TRACK.

The old floor panels were successively replaced by new beams and stringers by parties working from both ends who just jacked the old floor longitudinally if necessary to make the old stringers clear the flanges of the new floorbeams. The new stringers previously used in the outside material tracks were suspended between the trusses and the old stringer and floorbeam connection rivets were replaced by bolts. The laterals were suspended and their temporary connection plates removed.

The track rails were disconnected and longitudinally hauled clear of the panel and the worthless old ties dumped in the river. The next panel of old stringers was suspended from sway bracing and the old floorbeam disconnected and temporarily suspended from sway bracing. The new floorbeam was disconnected from the bottom chords which were jacked apart and bolted to floorbeam with filler plates inserted.

The two stringers temporarily suspended between the trusses were connected to the floorbeam

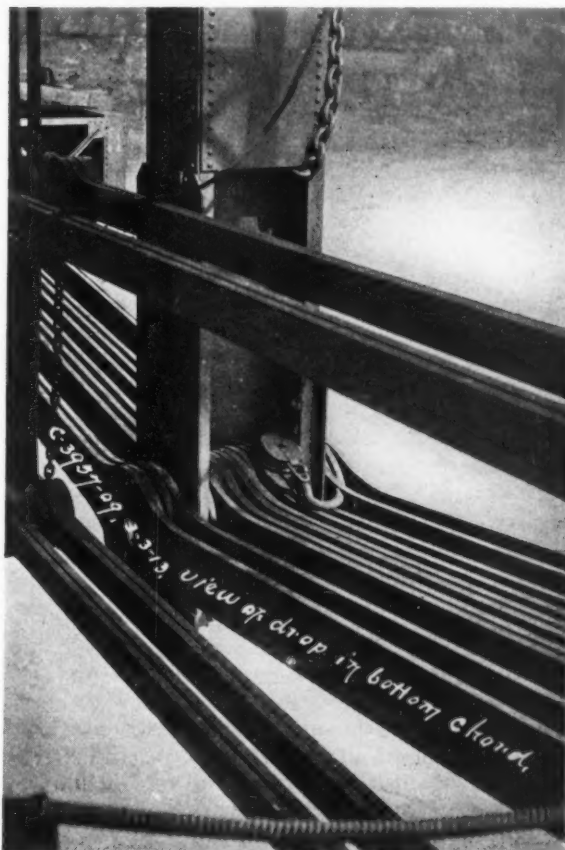
and the latter was finally adjusted in proper position and service bolted to carry trains. After traffic was resumed, the stringers for the other track in the same panel were erected and the bottom lateral system assembled and connected. The interruption in train service for each panel varied from 55 to 90 minutes, and the whole floor was changed in 7 weeks notwithstanding a delay of two weeks due to an injury to one of the travelers. After the old floor was entirely removed, track was laid on the other pair of new stringers and traffic diverted to it, permitting the track to be laid on the first pair of stringers.

The bridge was designed, fabricated and erected by the American Bridge Company, C. W. Bryan, chief engineer, C. G. E. Larsson, assistant chief engineer, who devised the general construction method, W. G. Grove and Henry Taylor, assistant engineers. The diagrams illustrating this article are reprinted from a paper by W. C. Grove and Henry Taylor, published in the Transactions of the American Society of Civil Engineers, Volume 79, page 411.

Rapid Repairing of Baltimore Pavements

The highways engineer of Baltimore, Md., August E. Christhilf, has completed the development of a plan whereby all the streets in the old city will be repaired in 60 days, the plan having been recently submitted to and approved by the Board of Estimates.

The old city has been divided by Mr. Christhilf



CENTER PANEL BOTTOM CHORD PREVIOUS TO FINAL ADJUSTMENT OF CENTER PANEL OF TOP CHORD.

into three zones, the first of which has been assigned to the American Paving Company, the second to P. Flanigan & Sons and the third to the Baltimore Asphalt Block and Tile Company.

For this repair work the three contractors will be paid on the square yard basis, the Board of Estimates having decided that this method of doing the work will be much better than the proposed "cost plus" plan, at the same time assuring the hurried completion of the repairs.

At an estimated cost of \$300,000, the State Roads Commission will resurface with sheet asphalt the main thoroughfares of the New Annex. This work will be paid for out of the city's share of the State Roads Fund.

Water Consumption in New Bedford

During the year 1919 the water consumption in New Bedford, Mass., averaged 78 gallons per capita, which was 4 gallons less than the year previous. Of this, 26.7 gallons per capita was used by domestic consumers, 39.7 by manufacturing consumers, about 0.8 gallon was used in cleaning the reservoirs, and the balance, or 14 per cent. of the total consumption, was used for flushing mains and extinguishing fires, leakage and unaccounted for. In 1899 the consumption averaged 107 gallons per capita, and diminished from this to 69 gallons in 1914, after which it rose to 82 gallons in 1918. Meantime the number of meters increased from 734 in 1898 to 15,019 in 1919.

Road Bulletin for Massachusetts

Commissioner John N. Cole of the Massachusetts Department of Public Works is making plans for issuing a road bulletin service for the benefit of motorists and truckmen. It is his intention to have information gathered every week as to the condition of the principal motoring routes throughout the state, with data concerning detours, road construction and the like, and to issue it regularly in bulletin form.

Last fall the United States Weather Bureau inaugurated a highway weather service which covered the condition of roads in New England with particular reference to the weather. As the roads are little affected by weather during the summer months and the Weather Bureau did not regard it as within its province to continue the service for such things as construction obstacles, the service has been discontinued till fall.

East Cleveland Zone Ordinance Upheld

The city of East Cleveland, a suburb of Cleveland with a population of about 30,000, adopted a building zone plan for the city in July, 1919. Four zones were established, an unrestricted industrial zone, a business zone restricted against manufacturing of all kinds, an apartment house zone restricted against manufacturing and business, and a private dwelling zone restricted against manufacturing, business and apartments.

Following the adoption of this ordinance, the building inspector refused to issue a permit for the erection of eight apartment houses in the private dwelling zone. The case came before Judge Foran,

who sustained the validity of the ordinance. The case was not fully argued before him, and no evidence was submitted by either party, and a rehearing was granted which came before Judge Kramer. Here evidence and arguments were submitted by the city, but substantially no evidence was given by its opponent. Judge Kramer on April 30 rendered his decision, "First, that the ordinance here in question is a valid exercise of the police power by the city of East Cleveland, under the authority of its charter; second, that it has not been shown that the classifications made under this ordinance are unreasonable, arbitrary, discriminatory and not uniform in operation." The petition was therefore dismissed.

The Judge, in sustaining this decision, stated that there could be no two opinions upon the proposition that the apartment house or tenement in a section of private residences is a nuisance to those in its immediate vicinity. While the erection of one apartment house in a district may seriously affect only a few in its immediate vicinity, it is common experience that, when one apartment has been erected, the whole street will soon be given over largely to apartment houses. The apartment house is for many a desirable convenience and for some a necessity; their erection should not be prohibited, and under the ordinance is not prohibited, but they are merely restricted to certain defined areas. No owner of property should be permitted to so use his property as to detract from the value of that of his neighbors when the demand or necessity for such use can be met equally well by the use for this purpose of property in other locations.

Yonkers Zone Ordinance

On April 15 the Zoning Commission of Yonkers, N. Y., held a public hearing on a tentative zoning ordinance, in the preparation of which Herbert S. Swan served as consultant to the commission. The ordinance is divided into six articles, the first giving definitions of the terms used, the second specifying the use districts, the third the height districts, the 4th the area districts, while the 5th provides for a board of appeals and the 6th is general and administrative.

The use districts are given as residence, business, industrial and heavy industrial. Residence districts are restricted to certain uses named, including boarding houses, hotels, churches, schools, hospitals, truck gardening, private garages, etc. In defining business district, the ordinance names the uses for which no building in the district can be used, and the same is true of the industrial districts, from which are excluded the manufacturing of asphalt, brick, gas, iron, rubber, etc., or "any other trade, industry or use that is noxious or offensive by reason of the emission of odor, dust, smoke, gas or noise." Residence and business uses are not excluded, and no uses are prohibited in the heavy industrial district which are permitted in any of the others. As the heavy industrial district prohibits a number of trades and industries which are offensive by reason of the emission of odor, it apparently follows that these are prohibited anywhere within the limits of the city.

Height districts are divided into four classes:

35-foot, 50-foot, 75-foot and 100-foot; with the usual exception granted to church spires, towers, chimneys, etc.

A board of appeals is established consisting of five members appointed by the mayor for a term of three years, which may, after public notice and hearing, determine and vary the application of the regulations in harmony with the general purpose and intent of and within limits specified in the ordinance. If an appeal to the board fails to receive four votes in its favor, this will be deemed as denying the appeal.

Granite Block on Old Concrete Base

Repaving part of Park Avenue, New York, for heavy traffic, with granite blocks replacing asphalt blocks on the original base. One illustration.

From Clairmount Parkway to Tremont Avenue, a distance of about seven blocks, Park Avenue, New York, was repaved last fall by J. Leopold & Co.,

Inc., with a granite block surface, replacing an asphalt block surface on the original, undisturbed concrete base. The street here is about 33 feet wide. The area covered amounted to about 15,000 square yards and was executed in about 75 calendar days.

Operations were commenced by a gang of 15 men with pinch bars, removing the old blocks and loading them into automobile trucks, by which they were immediately hauled to the dump and there wasted, since they had no commercial value.

About 200 or 300 feet in the rear of this stripping gang, there followed the cleaning gang of five men who, with picks and shovels, removed the $\frac{1}{2}$ -inch mortar bed from the old concrete surface, loaded it into the trucks to be hauled away and thoroughly washed the surface with hose and stiff splint push brooms.

The stripping and cleaning of the seven blocks occupied about three weeks and was executed at intervals corresponding with the paving of each block as a separate operation, completed before the next block was commenced, so that the heavy traffic was diverted from only one block at a time.

A mortar gang of 8 men with hoes carefully blended 3 parts of clean sand with 1 part of Portland cement to make the $\frac{3}{4}$ -inch thick cushion carefully spread over the concrete about 10 feet in advance of the pavers. Sand and cement delivered in automobile trucks were stored on the street, the



LAYING NEW GRANITE PAVEMENT BLOCKS ON OLD CONCRETE BASE IN PARK AVENUE, NEW YORK.

cement bags being protected by small movable houses of about 500 bags capacity.

As fast as the cushion was prepared, the pavement was laid by a 12-man gang at the average rate of about 300 yards in one 8-hour shift.

The granite blocks were of the Durax type, which consists of cubes from 3 to 4 inches square, laid in concentric circular arcs so that none of the principal lines of joints parallel the traffic, a feature that is considered to greatly improve the smoothness of traffic and the durability of the surface. The blocks are intentionally varied in size to enable them to meet this style of arrangement.

The blocks were rammed to the required street crown and compacted by a roller of $2\frac{1}{2}$ tons weight or more.

The pavers were followed by the grouting gang, which filled the joints with cement grout mixed in a Koehring steam-driven grouting machine and thoroughly broomed over the surface.

The different operations followed each other continuously and systematically, completing the work at the rate of about 1 block per week and not involving the closing of any part of the street for more than 10 days.

The retention of the old concrete base, which was found to be in satisfactory condition, expedited the work and secured an economy estimated at from \$2 to \$3 per square yard.

The use of the small Durax blocks permitted the replacement of a worn, shallow pavement without raising the grade or disturbing the foundation. It has proved so satisfactory that there are now under construction in the Borough of the Bronx about

15,000 yards of this pavement which are to be completed in 1920.

Since the completion of the work above described the cement joint filler has been superseded by a bituminous filler composed of equal parts by volume of clean sand passing through a 10 mesh sieve, heated to a temperature of between 300 degrees and 400 degrees Fahrenheit, and mixed with an equal volume of paving cement at a temperature of from 325 to 400 degrees Fahrenheit.

In practice about $2\frac{1}{2}$ cubic feet of hot asphaltic cement is poured into a concrete carrier pushcart of 7 cubic feet capacity, the hot sand is added to it and the mixture thoroughly stirred with a rake or perforated hoe and promptly flushed into the joints until the container is emptied before a new batch is prepared. Sufficient men and apparatus are required to pour all the joints of the pavement the same day that they are laid, after which the surface is covered with coarse, dry, hot sand.

This pavement is intended to sustain a very heavy traffic, under which it is stated to have given good satisfaction in this country for 8 years and in Europe for about 35 years.

Labor conditions that are unfortunately typical of many parts of the country are reported from the Pittsburgh district, where carpenters receiving 87c per hour struck for \$1.12 $\frac{1}{2}$ and were offered \$1, with the request that they wait until the Pittsburgh scale had been signed, in reply to which they immediately withdrew their offer and, without warning, 400 struck for \$1.25.

Reinforced Concrete Highway Bridges

Details of design, specifications and construction which should be studied with a view to developing and standardizing practice in this branch of highway work, as proposed by the chairman of a committee of the American Concrete Institute.

The American Concrete Institute has, as one of its committees, one on reinforced concrete highway bridges and culverts. This committee at the recent convention reported progress, but this was more than the perfunctory "progress report" which so often means that nothing has been done by a committee during the year. On the contrary, the chairman of the committee, A. B. Cohen, has had drawn up a quite elaborate outline of the work which it seemed desirable for the committee to adopt as its program of work during the coming year or years. In fact, in a letter to this journal Mr. Cohen admits that the work is so comprehensive that it is almost certain the committee will not be able to cover it in full for the next conven-

tion, but it expects to get under way in an attempt to "place concrete bridge construction on a more uniform basis, comparable with the uniformity found in structural steel work."

This outline of what is proposed is divided into the several main heads of "Recommended Practice," "Assumptions in Design," "Specifications" and "Methods of Construction." Under the head of "Recommended Practice" are considered architecture, construction joints, curbs, clearances, devices, drainage of floors, expansion joints, electrolysis, fill over arches, foundations, preliminary study and investigation of bridge site, paving, plans, reinforcing steel, types of bridges, water-proofing and piers and abutments. "Assumptions in De-

sign" are considered under the head of arches, weights of material, load assumptions, load distribution, impact, design of slab of T beams, earth pressures, designs of forms and faulty design. Under methods of construction are considered arch construction, removal of forms and chuting concrete.

RECOMMENDED PRACTICE.

It is considered that in designing concrete bridges, since they are to have long life and since "Concrete lends itself to a most graceful and admirable form of architecture," respect should be paid to architectural features, it being the experience that tax payers are willing to pay a little more for improvement in appearance.

"Construction joints" is believed to be one of the most important questions in concrete bridge design. No bridge plan is complete without showing the location of every possible construction joint, involving the daily capacity of an average mixing plant, so that the contractor will know the intention of the design beforehand and be prepared to regulate his work accordingly. Recommendations should be made dealing with construction joints of large and small arches built on either normal or skew span, for horizontal joints in mass work, for joints in rectangular and T beams, in slabs, etc.

Where a pier or retaining wall is of such height as to necessitate horizontal construction joints, the rusticated or grooved joint has been used to good advantage in place of irregular, unsightly joints.

The lengths of the reinforcing rods should be so determined that only a sufficient amount for proper bonding should project beyond the construction joint. (The Chairman has a photograph showing rods extending at least 35 feet vertically above the top or skew back of a pier in arch construction.)

Curbs of bridges should be higher than in ordinary street work, because of the danger that a vehicle, if it should amount onto a sidewalk, might crash through the railing; moreover, there is no necessity for pedestrians to leave the sidewalk for the roadway or vice versa.

There should be adopted standard vertical and lateral clearances for steam and electric railways.

It might be advisable to give some space to devices that have proved their worth in simplifying construction, such as form ties and spacers, bar cradles and hangers, wire mesh, etc.

Drainage is so inter-related with expansion joints, water-proofing and construction joints that all these must be considered jointly in a successful design of a floor system. Water must be carried off the floor in as many places and as quickly as possible. Down spouts should not be placed in concrete sections without due regard for expansion of the metal drain pipes. Drain outlets should not be placed where the drip will pour over a concrete surface or where icicles forming overhead will endanger life. Drainage of abutments and retaining walls by French drains and weep holes should be considered.

Expansion joints are as necessary in concrete construction as in steel. How far apart they should be placed to work effectively in the various types of concrete design, in floors over arches, spandrel walls over arches, T beam or rectangular beam or

slab construction, in flat slabs, retaining walls, abutments, etc., should be determined. Also the respective merits and defects of the various types of expansion joints, viz., sliding, rocker and cantilever joints. For the sliding joints, steel, copper and bronze plates and asphaltic membrane have been used with varying degrees of effectiveness. A complete break in structure by an arrangement of a double row of columns, depending upon the flexure in the column to take up the movement due to temperature changes, has proved very effective. The chairman believes that sliding joints should be discouraged on account of their uncertainty. A slight settlement or irregular construction may cause friction on a sliding joint which has greater resistance than the vertical section of a particular member in shear, which results in an unsightly and dangerous crack near the expansion joint.

In spandrel floors over arches, a vertical joint in the floor slab formed by cantilevering slab from spandrel or cross walls has proved very effective, since by this arrangement the vertical movement of the floor, due to rise and fall of the arch ring and the horizontal movement of the floor system itself, are well taken care of.

Consideration should be given to the precautions to be taken when arches and culverts are placed under deep fills, to prevent overflow of the embankment over head-walls and wing-walls. It is believed that the slope of the embankment will vary with different heights of fill.

For foundations, the soil should be tested for each particular bridge, but to provide for cases where this is not practicable, a classification of the various soils should be made, and the bearing power of each class determined.

In connection with reinforcing steel, bending diagrams and a thorough list of all bars should be shown on the plans. Consideration should be given to the best form of stirrups, to the minimum spacing of bars in beams, and to the protection of stubs exposed during winter weather.

Bridges should be classified, giving the type best suited for various general conditions of span, length, width, foundations, etc.

Waterproofing systems can be divided into two classes—membrane and integral. For the former either felts, papers, or cloth, or a combination of these materials, is generally used. Mr. Cohen does not believe that any of the numerous integral methods on the market are applicable to any degree for water-proofing bridge floors susceptible to cracks. A water-proofing membrane should be protected and made more durable by covering it with asphaltic mastic, a layer of brick, or a two-inch layer of concrete. Bituminous pavements should not be laid directly on the membrane.

How should piers and abutments in streams be protected against scouring action of the water? Are piers in roadways a menace or a help in safeguarding traffic?

ASSUMPTIONS IN DESIGN.

What range of temperature should be considered in designing arches for the various climatic zones? Does the present accepted formula give values in excess of those that actually exist? (Bulletin 30

of Iowa State College by C. S. Nichols and C. B. McCullough, describes the first effort known to the chairman for determining actual temperature changes and effects).

Load assumptions should be made for trucks and traction engines and electric traction loading, the latter being classified by weight in increments of five tons for both city and interurban cars, giving the spacing of wheels and truck centers. A compilation should be made of the laws passed by all the state legislatures regulating or limiting the weights of vehicles.

The 1919 report of this committee relative to the distribution of concentrated roads over simple rectangular slabs, over a series of T beams, over slabs superimposed on steel I beams, over arches distributed through various depths of fills, and on floor slabs and girders of a through girder bridge, are not considered conclusive but open to wide discussion and further investigation.

Consideration should be given to the allowance to be made for impact, whether this be by adopting a loading in excess of the actual loading, or by using the actual loading and adding a factor depending upon the length of span or dead load.

Special study should be made of the theoretical and practical considerations involved in the designing of the slabs of T beams.

Data are needed on the subject of the pressure of earth against retaining walls and whatever data

are available should be collected and the tests already made should be enlarged upon.

The subject of pressures upon forms and unit stresses in the forms themselves should be looked into.

It might be advisable to tabulate some of the mistakes that have been made repeatedly; for example, timber grillage constructed above water-level to support masonry piers or abutments, tendency to use empirical formulas in designing walls and abutments, the use of wide differences in sections of wing walls and abutments at the junction of the two, placing foundations above frost line, lack of proper drainage of retaining walls and abutments.

METHODS OF CONSTRUCTION.

Under this head would be discussed the various types of arch centering, methods of constructing arches by voussoirs, methods of constructing skew arches, time for removing forms under variable conditions of temperature, etc. Concerning the last it would seem that a more scientific analysis leading to definite regulations could be developed on the basis of existing data, of which some very important illustrations can be found in a paper by Professor A. B. McDaniel, before the 1916 convention of the Institute.

Chuting concrete has developed so rapidly and with such success that many abuses of the system exist, which the committee should ferret out and prohibit in proposed new specifications.

Disposal of Municipal Wastes

By Joseph Goder *

The author discusses the several methods of disposal, giving his reasons for concluding that incineration is decidedly preferable for some classes of waste in all cases and for all classes in some cases. The interrelation of collection and local characteristics of the several classes of waste material with the most desirable method of disposal is pointed out.

The disposal of the daily accumulation of refuse is a problem of increasing concern, and is a subject of discussion in almost every issue of the leading engineering papers. The articles that appear, however, generally refer to a special method dealing with one or more composite parts of municipal waste. They do not and are not intended to cover the entire disposal problem. The disposal of garbage and the treatment and disposal of sewage are predominantly considered. The published papers illustrate clearly the path followed by the authorities to solve the refuse disposal problem: a certain part of the total communal refuse is dealt with, without due consideration to the other waste material, which is left for later consideration.

This procedure is utterly wrong and is one of the cardinal reasons for many failures and the present deplorable status of the disposal problem.

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Municipal waste comprises everything discarded by the individual or community. Sewage is as much a part of municipal waste as street sweepings and discarded bottles. The disposition of the various classes of municipal waste is *one problem* and should be considered as such. This does not mean that only one method of disposal should be employed to consume or utilize the various component parts of the communal refuse—which would be most ideal—but that methods or means shall be chosen to co-operate with each other, forming a unit disposal system. Nor is it necessary to install the entire system at one time. However, it should be so planned and designed that future disposal plants will form integral members of the system and will co-operate with the already installed units.

Such a co-operative system of disposal plants for the total municipal refuse can readily be established and will not only reduce the necessary in-

vestment, but will also lower the cost of operation and will increase possible revenues. In fact, a well worked-out disposal system for medium and large cities will prove at least self-supporting and will, in many instances, bring actual revenues.

It is a foregone conclusion that recuperation of the valuable constituents of refuse matters deserves the most careful attention—next to sanitation of the disposal process. All efforts must be bent to assure a financial success. It is with this object in view that the disposal problem should be judged at large, so as not to offset a financial gain in one branch of the disposal system by economic failure of the other members of the system. Full consideration of the interdependence of the different disposal means or units is necessary to achieve an economic success. This point is too often overlooked in the selection of the means of disposal.

In the selection of disposal methods for certain classes of waste, the question of how to dispose of other refuse matter and what the cost of such disposal will be must be clearly defined; and not only the cost of disposal, but also the cost of separate collection will often govern the proper selection of the methods.

Unfortunately, the experience of most cities cannot but convince one of the haphazard nature of the efforts put forth in the solution of the waste disposal problem. Bids are asked for a disposal plant without a proper investigation having been made regarding the amount or the nature of the refuse to be disposed of. That such a negligent procedure spells failure is evident. Uncertainty in the specifications for bids greatly furthers the malpractice of unscrupulous builders of refuse disposal plants and leads to such conditions as we find, for instance, in the incinerator field, where more than fifty per cent. of the plants built have been abandoned or discontinued. As a protection for the reliable bidder as well as for the city, the greatest care in preliminary investigation is necessary.

To remove the uncertainties and thus minimize failures in the refuse disposal plant, it is necessary to base the solution of this problem upon a scientific basis and discard the prevailing rule-of-thumb methods.

Local conditions, such as topographical, climatic and sociological figure predominantly in the determination of the refuse disposal system. It would be impossible to recommend or advise a standard or perfect system. Each disposal problem presents itself as an individual engineering problem, demanding professional knowledge and practical experience. The municipal official entrusted with the task of laying out a successful disposal system finds himself confronted with a dire lack of standards for reference and comparison. His endeavor to familiarize himself with the requisite professional knowledge is handicapped by a mass of conflicting statements and a lack of concise reference literature for his guidance.

It is beyond the scope of this article to treat the subject exhaustively. We merely endeavor to give a short synopsis of the cardinal points to be considered in developing a successful disposal system.

IMPORTANCE OF STUDY OF QUANTITIES, COMPOSITION AND PROPORTION OF WASTE.

Most important is the correct determination of

the quantity and nature of the material to be treated. Each class of waste must be studied separately regarding quantity, composition and relative production in the various sections of the community. The writer holds the view that it leads to serious discrepancies to base the average quantities and composition of the refuse on records per capita of population. We suggest the following classification of waste and the determination of the factors mentioned.

Primarily there are few reliable records permitting us to draw an approximately correct conclusion. Not fifteen per cent of the towns of the United States having 5,000 and more inhabitants have even fairly accurate data regarding quantities of refuse collected. Various attempts made to collect statistics on quantity, nature and method of collection or disposal have foundered on the indifference of municipalities in keeping accurate and complete records. Secondly, too many causative factors depending on geographical, climatic and sociological conditions impede the establishment of probable averages.

A. Liquid and semi-liquid refuse:

1. Sewage:

- Total amount of sewage;
- Total amount of solids in suspension;
- Average and maximum daily quantities;
- Analysis of sludges to determine
 - a. Saponifiable greases and oils,
 - b. Fertilizing value of raw sludge,
 - c. Calorific value of sludge.

2. Night Soil:

- Where this matter is separately collected, the total, daily average and daily maximum amount should be known. The value of this material as fertilizer is undisputed.

B. Solid Refuse:

1. Garbage:

- All refuse of an organic nature, rejected in handling or preparing food;
- Total, daily average and daily maximum amount;
- Analysis to determine
 - a. Valuable greases;
 - b. Value of raw garbage as fertilizer;
 - c. Calorific value;
 - d. Food value for hog or cattle feeding.

2. Rubbish:

- Everything discarded, not otherwise classified;
- Total, daily average and daily maximum amount;
- Mechanical analysis to determine the amount of salable material, such as metal, paper, glass rags, etc.;
- Determination of the calorific value.

3. Ashes:

- Total, daily average and daily maximum amount;
- Determination of the calorific value.

4. Street sweepings:

- Total, daily average and daily maximum amounts;
- Determination of the calorific value.

5. Stable Manure:

- Total, daily average and daily maximum amount;
- Determination of the calorific value.

The obtaining of a reliable record of quantities and origin of production of the various refuse matters is the most important item. Such records should be kept, even if no improvements in the disposal system are contemplated. It requires at least a one-year record to obtain a conclusive estimate of the quantity, nature, seasonal changes and other necessary characteristics of the refuse production.

An analysis of accurate official records from year to year often enables a great improvement of the

existing collection and disposal system and will well repay the amount of labor involved in gathering the data.

In communities where the quantity of each class of material is small, the investigation may be abridged accordingly, but as the time and monetary outlay involved in making a complete research is comparatively small, I recommend a thorough study in most cases. Without complete information, any system installed must be more or less at random, and results are bound to be problematic. As stated before, the failures of many, if not most, disposal systems are chiefly due to lack of a thorough scientific study of the local conditions.

ELEMENTS OF THE PROBLEM.

The problems of collecting, transporting, and finally disposing of communal refuse are closely interwoven. In many instances a comparison of the relative cost of collection and sanitary handling of the refuse will be the deciding factor for one or the other disposal method. This feature is often overlooked and many statements showing on their surface a financial success of a certain disposal means, reveal a failure when properly investigated, on account of the higher cost of collection involved by the disposal methods employed. The collection and transportation of waste to the plants involves the highest cost of operation of a disposal system and should therefore be most prominently considered. We will refer to this feature in our discussion of the various disposal methods.

Economy of operation, reclamation of valuable constituents and, above all, sanitation of the entire system, decide the choice of the final disposal methods. The prospect of a possible financial gain derived from a certain disposal process must be carefully weighed against a possible increase of cost or inconvenience of the entire system. We often find in statements of special disposal process only the cost of operation of the plant itself compared with the financial returns; the higher cost of collection, amortization, depreciation, etc., is wisely omitted. A closer study of all factors pertaining to the disposal system as a whole will often favor a process apparently not so lucrative. The old saying "All is not gold that glitters" is especially true in the field of refuse disposal.

As repeatedly stated, the disposal problem must be approached in a broad way, giving full consideration to all phases and factors essential in the entire system. This demands not only an earnest study and knowledge of the fundamental principles of disposal methods, but also needs a clear conception of the principles underlying the operation of the apparatus used in producing the desired results of the various methods. Numerous failures of reduction plants as well as incinerator plants are due not to the wrong selection of the disposal means, but to the incompetency and utter inadequacy of the apparatus and furnaces.

The most essential factor in handling and disposing of municipal waste in sanitation. It does not suffice to make the collection and disposal system inoffensive to the public. Every precaution must be taken to safeguard the health of the operating force. This latter factor is too often neglected and abominable conditions are encountered in some disposal

plants. Another important point often overlooked is the dangerous character of the residue from disposal plants. We have seen so-called ash dumps from crematories containing large percentage of putrescible organic matter, hardly less offensive and dangerous than the obsolete garbage dump.

Next to sanitation, the recovery of the valuable constituents demands careful attention. This subject must be approached in the broadest manner, fully considering all phases of the collection and disposal system, with due regard to the cost of operation and installation of all means necessary to treat the entire waste matter. The opportunities of a community must to a great extent control the disposal methods.

The nature and diversity of the material to be handled lends itself readily to many suggestions and experiments. Most of them are visions by men not conversant with the subject and without the requisite technical knowledge. Many such attempts have proven dismal failures. We recommend careful procedure in trying new methods; however, there is such a thing as being too conservative, which often tends to retard progress.

(To be continued)

"Forced Aeration" Sewage Treatment

Our English contemporary, "Municipal Engineering and the Sanitary Record," believing that the name "Activated Sludge" was not sufficiently expressive of the process of sewage treatment that has been given that name, offered a premium of one guinea for the best suggestion for a substitute. The competition closed April 15th, and in the issue of the 29th that periodical made the following announcement:

We have pleasure in now announcing that the alternative title suggested by Mr. J. B. Croll, viz., "*Forced Aeration Process*," is the one which, in the opinion of the judges, is the most successful. A cheque of One Guinea has consequently been forwarded to Mr. Croll, Richmond Main Drainage Works, Kew Gardens. Amongst other titles which were suggested were the following, viz.:

- "Aerological-Protoxide of Sewage Purification."
- Alternative—"Aerological Protoxide Process."
- "Alternating Aerobic-Sedimentation."
- "Aerated Bio-sludge Mixture." Alternative—
- "Aerated Bacterio-sludge Mixture."
- "The Agitoxy Process."
- "Mechanical Aeration Process."
- "Biological Sewage Decantation." Alternative—
- "Intensive Biological Decantation."
- "Odorless Aeration System."
- "Aerated Bio-inoculation."
- "Agitated Biological Activation."
- "Oxidized Manurial Sludge." Alternative—
- "Oxygenous Sludge."
- "Diluterated (or Diluterated) Sludge Amelioration (or Fertilization)." Alternative—"Accelerated (or Accelerated) Sludge Amelioration (or Fertilization)."
- "Blow Aeration System."
- "The A. S. A. (Agitation, Sedimentation, Aeration) Process."
- "Aero Biological Process."
- "Aerobic Flocculation Process."

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New Name for Activated Sludge

The name "activated" sludge was, we believe, applied to the process so designated by the English investigator who gave the stimulus which has resulted in its recent popularity, and we have sometimes wondered why the American engineers and sanitarians accepted this name, without any suggestion, so far as we are aware, of changing it to one that would be more easily spoken and more suggestive to the uninitiated. The names "contact filters," "sprinkling filters," "septic tanks," "intermittent sand filters," "two-story tanks," all are much more expressive of the distinguishing characteristics of the several processes and are less awkward to pronounce than the term "activated sludge."

We were therefore interested to learn, a few weeks ago, that our English contemporary, *Municipal Engineering and the Sanitary Record*, was impressed with the same idea and was offering a premium for the best suggestion of a substitute name. The result of this contest is given in another column of this issue, and we must confess to disappointment. Most of the suggestions are, to our mind, even less acceptable than the name now borne by this process. The premium was granted to the name "forced aeration." This term is a little less awkward to speak and write, but is not quite so descriptive of the process as the name which it would replace. Several methods of forced aeration have been experimented with in the past for treating sewage, but the distinctive feature of this process is the mixing with the incoming sewage of sludge which has been treated to an aerating process; consequently the omission of reference to the sludge feature—the vital part—fails to distinguish it from former and unsuccessful uses of forced aeration.

The name activated sludge has now so rooted itself in the language of sewerage engineers and writers on the subject of sewage treatment that it is not probable that a change in the name would be made unless the substitute offered was unquestionably appropriate. As the proposed name does not possess this advantage, in our opinion, we question whether it will be adopted. Possibly we may be mistaken in this, or it may be that some other term

may be suggested which will receive the indorsement of sewerage engineers; but with every year that the present name remains in undisputed use, it becomes more firmly fixed in the language and its displacement becomes not only more difficult, but more objectionable because of the increasing amount of literature in which the old term has been used.

Building Zones and Street Classification

A few years ago it was confidently predicted by many that neither public sentiment nor the courts in America would uphold the restricting of private rights to the extent of adopting and putting into force the idea of building zones. The last few years however, have seen the adoption of ordinances establishing such zones in a number of cities and the upholding of such ordinances by the courts. A decision of this kind in East Cleveland is recorded in this issue.

This suggests the idea, which we have referred to before, of the restricting of certain streets to special kinds of traffic, the advantages of which are appreciated by all engineers who are interested in constructing, and especially by those interested in maintaining, the pavements of city roadways. If it is possible to put into effect ordinances limiting the use that can be made of private property by its owners, there would seem to be no question that cities can set aside given streets for specified kinds of traffic, nor any question that the people will submit to and approve of such restriction if they are convinced of its desirability.

With no restrictions on the use of any street which does not apply to all streets, it becomes necessary to make all of the roadway pavements throughout the city adequate for carrying the heaviest and speediest traffic, on either steel or rubber tires, that is not altogether prohibited by city or state law. It should not be difficult to convince any intelligent taxpayer that it costs more to build and maintain a pavement which will carry the heaviest loads without injury than it does to provide a pavement adapted only to delivery wagons and passenger automobiles, with coal wagons as possibly the heaviest vehicles which need use these residential streets.

In addition to this matter of cost of pavement and destruction by heavy vehicles, we have that of convenience to the vehicle owners themselves. The extensive use of a street by slow moving trucks, both horse-drawn and automobile, interferes most aggravatingly with the desire for speed of those riding in passenger automobiles.

Other classifications of traffic will naturally suggest themselves when the subject is considered. The general idea which we wish to suggest, however, is that different classes of traffic be confined to certain specified streets, just as certain classes of buildings on the basis of use, height, etc., are restricted to certain areas of the city. For example, any vehicles weighing more than two tons or carrying more than 1,500 pounds on one wheel might be confined to certain routes through the city. Also, vehicles ordinarily traveling at a speed of less than six miles an hour (or some other limit) might be

prevented from using streets which would thereby become favorite routes for speedier vehicles.

Of course, it would be necessary to use great judgment in selecting the routes for the several classes of traffic, but the problem would be by no means an impossible one. It will be rendered all the easier by the adoption of building zones, the latter segregating in certain sections of the city those businesses or industries that require the use of heavy trucks.

It is conservative to estimate that a pavement adequate for light traffic can be built for 50% less than one required by heavy motor trucks. It also seems probable that at least 75% of the mileage of streets in the city could be restricted to the lighter traffic. This would mean that a saving might be made of 37½% of the cost of pavement construction in a city by the restricting of motor trucks to certain routes. As a matter of fact, we believe that 10% of the street mileage would furnish adequate routes for heavy trucking, thus giving a saving of 45% of the construction cost. In addition to this, with the heavy trucking limited to a few streets, the authorities would naturally feel that they could afford to spend more money on this limited mileage in order to secure heavier pavements than they would feel warranted in providing for all of the streets in the city on the chance that they might be used by heavy trucks.

Other considerations naturally suggest themselves, whereby the requirements of each class of vehicles could be studied, and pavements be classified so as to meet more fully the requirements and wear of each class of traffic than would be possible where provision had to be made for use of the same pavement by all kinds of traffic.

It is no argument against this idea that it has not been put into practice before this, one explanation undoubtedly being that paving is only now developing into a science, with much to be accomplished before even the fundamentals of that science are well understood; while on the other hand, it is only within a few years that vehicles have become so diversified as to weight, speed, nature of tire and other conditions which are largely responsible for the need for this classification of traffic and of the highways allotted to carrying it.

Replacing Pavement Surfaces

As the nature of traffic on a street changes, or as the science of paving develops, or the officials of a given city change their ideas as to pavements, it often becomes desirable to replace an old wearing surface with another of a different kind. And the old base will of course be used if possible. But trouble arises from the divers thickness of wearing surfaces, which may vary from an ⅛-inch bituminous carpet on a concrete pavement to an old-style 8-inch stone block on a 2-inch sand cushion. Modern specifications call for stone blocks 5 inches deep, and wood blocks or bricks 4 inches deep, with or without a 1-inch cushion; while a 3-inch depth of combined sheet asphalt and binder is common. A carpet is seldom used in city paving on a concrete base.

We have, therefore, the depths 3, 4, 5 and 6 inches from pavement surface to top of base as common city practice. If we try to substitute a new 3-inch

surface for an old 6-inch one, we must either tolerate a high curb face and lower the manhole heads and similar objects set in the pavement, or else add three inches to the concrete base; neither of which is seriously objectionable except for the cost of the latter.

But, if we try to substitute a 6-inch stone block surface for a 3-inch asphalt one, we find that either the pavement grade must be raised 3 inches, thus reducing the curb height by that amount and necessitating raising manholes, railway tracks, etc., or else the old base must be abandoned, involving the cost not only of building a new one but also of removing the old. Either alternative possesses serious disadvantages.

Either brick or wood block can be set on a concrete base in a thin mortar cushion, thus raising the pavement only one inch higher than the former sheet asphalt, which is not often seriously objectionable; or blocks or brick only 3 inches thick can be used; the latter the so-called vertical fiber brick. And some cities have replaced these thin surfaces with stone blocks, using those of small dimensions known as durax. Such use of stone blocks in New York City is described in this issue.

With 4-inch blocks of wood, stone and brick used for paving, it suggests itself whether this could not be made a standard thickness for sheet asphalt as well, as by increasing the thickness of the binder. We would thus have all standard kinds of pavement (including bituminous concrete) with wearing surfaces of practically the same thickness and therefore any one could be replaced with any of the others without any additional expense being involved or the street grade changed.

Hetch-Hetchy Aqueduct Tunnel Contract Let

The contract for the construction of 18 miles of aqueduct tunnel for the Hetch-Hetchy water supply to the city of San Francisco was awarded on May 3 to the Northern Construction Company of North America, for an estimated sum of \$7,802,952 on the basis of cost-plus-a-fixed-fee for the contractor. The contract has already been approved by the Board of Public Works, ratified by the Board of Supervisors and threatened with a taxpayers' injunction suit. In order to finance the work, it is necessary to immediately sell \$8,000,000 of water bonds, and the fact, already stated in these columns, that these bonds are at a heavy discount is causing much trouble. They are quoted on the local market at 87½ per cent and as the city charter forbids their sale at less than par, considerable juggling is necessary to accomplish the deal and has finally been provided for by making the contractor's fee large enough to cover the difference between par and market value and include compensation to him for supervision of the work.

This, of course, meets with strong local opposition, especially as one of the competitive bidders on a straight unit-cost bid offered to do the work for nearly \$2,000,000 less than the estimated cost under the present contract.

The project includes the development of a large and valuable water power, potential in the supply

brought from a source hundreds of feet higher than the elevation of the city, and the opponents of the scheme are denouncing this feature, which does not materially increase the cost of construction and conserves a great deal of energy that it would be inexcusable to waste, while it in no way delays the delivery of water for domestic purposes.

Improvement of Freight and Passenger Transportation

At the Atlantic convention of the United States Chamber of Commerce the committee on resolutions presented a number of resolutions and declarations concerning various important public interests which were passed by the large number of delegates in attendance from all parts of the country.

These delegates represent the most prominent successful and conservative business and professional men in their respective communities and their views may be safely taken to express the most careful and farsighted opinions of the responsible elements of the nation and as such are entitled to great weight. Among these resolutions are two that are especially pertinent to the field of Public Works, that were recorded as follows:

Waterways

Waterways afford opportunities for increasing the facilities of transportation available to our industries and commerce. Immediate needs for movement of fuel, materials, and products require that Congress should at once make appropriations ample for improvement and maintenance of commercially meritorious harbor, river-channel and canal projects which it has approved and which have the interrelation with one another or with other means of transportation that is essential for routes of traffic.

Traction Services

Every phase of the life of a community is affected by the success or failure of its traction lines in providing a service which is indispensable to the public.

Careful regulation joined with concern for the business stability and success of traction lines should prevail in each city of the country. Adequacy of service at the lowest rate compatible with continued efficiency is the paramount consideration from the public point of view, and neither factor can be sacrificed to the other without public detriment. Each community is urged to consider the situation of its traction service from these two points of view, in order that it may ascertain if the increased costs common to all business have been unaccompanied by added revenues sufficient to maintain the service requisite for the industrial and commercial efficiency of the community.

Century-Old Bequests for Convenience Stations

Funds accrued from provisions of the wills of Benjamin Franklin and of John Scott, another early Philadelphian, are to be used by the Board of City Trusts of Philadelphia, Pa., for the erection of public convenience stations.

Agreement to that effect was reached last week at a meeting of the board, which acted upon a suggestion by Mayor Moore.

The funds total \$80,408. They include and have accrued from a bequest of £1,000 left by Franklin to "make living in the town more convenient to its people, and more agreeable to strangers," to be applied after one hundred years, and a similar bequest of \$3,000 left by Scott.

Farmers Favor National Highway System

Farm sentiment is very strongly in favor of the construction and maintenance of a national system of highways, if replies received to a referendum by the American Farm Bureau Federation can be taken as a criterion. The federation is one of the largest farm organizations in the United States. Answers to the highway question are almost unanimously in favor of a broadened national road policy.

County Highway Data

Information from county highway officials supplementing that tabulated in our issue of April 3. Work done during 1919—Practice as to road shoulders—Resurfacing highways.

Information of various kinds concerning county highway work done during 1919, with details of construction and repairing, was given in the April 3 issue of Public Works. The tables in this issue contained information which had been received, in response to our questionnaire, up to about a week prior to publication. Since that time we have received a number of additional responses, and we give in this issue supplementary data on the same points covered by our tables in the April 3 issue.

Many of the cards received contained additional data concerning the cost of maintaining pavements

of different kinds, none of which has yet been presented. We expect to give this information in tables to be published next week. These tables will give, for each of a considerable number of cities, the cost per square yard or per mile for maintaining various kinds of pavements, together with the length of pavement maintained, its average width, such information as could be given concerning the amount of travel over the road, the expenditure for maintenance during 1919, and the average cost for a period of years.

Concerning the supplementary data in this issue,

there is little to add to the comments given in our April 3 issue. One of the points that has been brought most forcibly to our attention is the fact that a very considerable proportion of the counties have kept no adequate records of work done. A very common reply received by us from county engineers was that they have been in their present position for only a few months, and that the records of their predecessors do not furnish any information from which they could answer questions

as to amount of work done, cost, or other essential facts concerning either construction or maintenance of the county's highways. It is encouraging, however, to note that very many of these recognize that there should be records from which our questionnaire could be answered and assure us that, if a similar one reaches them a year from now, they will then be able to answer it from the records which they are now keeping or are preparing to keep during the current year of work.

PRACTICE AS TO ROAD SHOULDERS.

State and County	Type of Road	Width of Shoulder, Feet	Material Used on, or Other Treatment of Shoulder	Protection of Edges of Pavement
Alabama:				
Madison	gravel	4	none	earth banked against gravel curb on some
Mobile	gravel	4	none	.....
Idaho:				
Benewah	plain macadam	20' roadbed, 18' surfacing	.....	.....
Bonneville .....	.....	3	gravel	.....
Caribou .....	.....	20' on state highway, 18' on county roads	.....	.....
Seventh Dist. ....	.....	3	.....	none
Illinois:				
Stephenson .....	.....	18' hard pavement, 6' earth; 10' hard pavement, 3' stone and 6' earth	.....	.....
McHenry .....	.....	6' earth, 10' concrete, 4' gravel and 6' earth	.....	none
Menard .....	.....	10' concrete with 4' shoulders	patched with gravel water-bound macadam	none
Washington .....	.....	.....	earth with macadam	none
Indiana:				
Dubois .....	.....	5½	none	none
Iowa:				
Clayton .....	.....	6	gravel surface	street curb bars
Pottawattomie ..	.....	3', with concrete pavements	crushed limestone	none
Kentucky:				
Graves .....	.....	3' earth	Bermuda grass on fresh fills	.....
Russell .....	.....	3' with 14' metal; 5½' with 9' metal	.....	.....
Louisiana:				
Avayelles .....	.....	5' earth with gravel types	.....	.....
Maryland:				
Kent .....	.....	5' of dirt	none	none
Michigan:				
St. Clair .....	.....	4	none	none
Minnesota:				
Anoka	concrete	4' 1919; 6' 1920	no special material	none
Cottonwood .....	.....	5	.....	.....
Isanti .....	.....	6	none	.....
Martin .....	.....	24' on dirt road	.....	.....
Ottertail .....	.....	24 and 30	.....	.....
Swift .....	.....	4' on 18' concrete	maintenance gravel	none
Wilkin .....	.....	24	.....	.....
Mississippi:				
Noxubee	gravel	20 and 22	shoulders dragged, slopes sodded	.....
Missouri:				
Miller	gravel	2' to 4' on gravel roads	plain earth	.....
Montana:				
Flathead .....	.....	3	none	none
Phillips .....	.....	16	.....	.....
Sheridan	gravel	5	.....	.....
New Jersey:				
Sussex .....	.....	5' with old roads, 6' on all others	earth; scraped, cleaned and rolled each spring	none
New York:				
Oneida .....	.....	5	.....	none
North Carolina:				
Beaufort	dirt	.....	.....	.....
North Dakota:				
Hettinger .....	.....	34' roadway, 6' berm	.....	.....
Ohio:				
Mercer .....	.....	5	none	none
Oklahoma:				
Alfalfa	dirt	3' stone, 3' additional earth	oiling	metal inserted shields
Oregon:				
Columbia .....	.....	16	.....	.....
Multnomah .....	.....	2' macadam, with bit. concrete	macadam	.....
Tennessee:				
Campbell .....	.....	4' on each side, earth	none	4' earth shoulders
Vermont:				
Orleans	telford stone	3'6"	dirt	9
Washington:				
Clarke	road	3	.....	none
King .....	.....	2', gradually widened by maintenance crews	gravelly material from sub-grade	Flush curb of concrete for brick, 3"x8" timber header for monolithic brick
Lewis:				
.....	.....	4	earth	.....
West Virginia:				
Monongalia .....	.....	3	crushed stone, thoroughly rolled	.....
Wisconsin:				
Forest	earth	6	.....	.....
Waushara .....	.....	20'-24' roadbed	.....	.....

COUNTY HIGHWAY WORK DONE DURING 1919.

State and County	Amount of county, state and federal money spent	Bitum. concrete, sq. yds.	Bitum. macad. ml. or sq. yds.	Plain macad. ml. or sq. yds.	Sand-clay, ml. or sq. yds.	Gravel, ml. or sq. yds.	Cement concrete, ml. or sq. yds.	Brick, ml. or sq. yds.	Earth, miles or sq. yds.	Other work	Done by county or state forces	Done by contract
Alabama:												
Madison	\$100,000	.....	.....	1	.....	2	.....	.....	.....	.....	All	None
Mobile	180,300	.....	.....	.....	.....	1/2	.....	.....	.....	Rock asphalt, 1/2	Maintenance	None
Pike	65,000	.....	.....	.....	8	.....	.....	.....	.....	.....	All	None
California:												
Modoc	40,000	.....	.....	small amount	.....	small amount	.....	.....	.....	Maintenance	All	None
Idaho:												
Boise	100,000	.....	.....	.....	.....	.....	.....	.....	?	.....	None	All
Bonneville	100,000	.....	.....	.....	.....	.....	.....	.....	.....	Grading, 40	All	None
Caribou	.....	.....	.....	.....	.....	.....	.....	.....	.....	Maintenance	All	None
Idaho	1,082,000	.....	.....	4	.....	.....	.....	.....	65	.....	None	All
Lenah	310,000	.....	.....	.....	.....	4	.....	.....	.....	.....	None	All
Seventh District	100,000	.....	.....	.....	.....	6	.....	.....	.....	.....	None	All
Valley	30,000	.....	.....	.....	.....	.....	.....	.....	10	.....	All	None
Illinois:												
McHenry	143,000	.....	.....	.....	.....	2 1/4	.....	.....	.....	Bridges & maintenance	None	All
Marion	35,000	.....	.....	.....	.....	.....	.....	.....	.....	Bridges	None	All
Menard	200,000	.....	.....	.....	.....	.....	.....	.....	.....	Oiled earth, 33;	None	Remainder
Stephenson	100,000	.....	.....	1	.....	.....	.....	.....	.....	Graded earth, 150	\$55,000	Remainder
Washington	40,000	.....	.....	.....	.....	.....	.....	.....	All	.....	None	All
Indiana:												
Newton	47,000	.....	.....	.....	.....	.....	.....	.....	.....	Stone repair	All	None
Iowa:												
Appanoose	60,640	.....	.....	.....	.....	.....	.....	.....	All	.....	\$55,140	\$5,500
Chickasaw	95,000	.....	.....	.....	.....	12 1/2	.....	.....	.....	.....	\$65,000	\$30,000
Clayton	90,000	.....	.....	.....	.....	1/2	.....	.....	2	.....	All	None
Hardin	110,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	\$65,555	\$44,450
Madaska	151,000	.....	.....	.....	.....	.....	.....	.....	All	.....	\$89,000	\$52,000
Pocahontas	164,826	.....	.....	.....	.....	17.2	.....	.....	.....	.....	\$137,316	\$27,510
Pottawattamie	222,213	.....	.....	.....	.....	.....	.....	.....	All	.....	Half	Half
Kentucky:												
Graves	42,000	.....	.....	.....	.....	5	.....	.....	.....	Grading & repairing earth roads	All	None
Russell	9,500	.....	.....	.....	.....	.....	.....	.....	.....	.....	All	None
Louisiana:												
Averyelles	30,000	.....	.....	.....	.....	4	.....	.....	.....	.....	None	All
Maryland:												
Kent	147,500	.....	.....	.....	.....	3	.....	.....	.....	Resurfacing, 2.65; pit run, 1	3.65	5.65
Michigan:												
St. Clair	800,000	.....	.....	.....	.....	.....	.....	.....	.....	Asphaltic concrete, 3; maintenance, 75	15,000 sq. yds.	4,050 sq. yds.
Washtenaw	200,000	.....	.....	.....	.....	60,000	160,000	.....	.....	.....	66 2-3%	33 1-3%
Minnesota:												
Anoka	217,997	.....	.....	.....	.....	14	.....	.....	.....	.....	None	All
Clay	42,000	6.6	.....	.....	.....	.....	.....	.....	.....	.....	All	None
Cottonwood	100,000	.....	.....	.....	.....	18	.....	.....	.....	.....	1	17
Isanti	27,638	.....	.....	.....	.....	7.03	.....	.....	.....	.....	1.5	5.53
McLeod	56,307	.....	.....	.....	.....	All	.....	.....	.....	.....	None	All
Nartin	140,000	.....	.....	.....	.....	5	.....	.....	.....	.....	All	None
Ottertail	155,000	.....	.....	.....	.....	12	.....	.....	.....	.....	\$73,000	\$82,000
Roseau	38,416	.....	.....	.....	.....	.....	.....	.....	.....	.....	10%	90%
Swift	171,500	1.5	.....	.....	.....	4	.....	.....	.....	Gravel & unsurfaced work	concrete	concrete
Mississippi:												
Wilkin	25,000	.....	.....	.....	.....	.....	.....	.....	All	Grading, 7	All	None
Missouri:												
Itawamba	50,000	.....	.....	.....	.....	.....	.....	.....	.....	Grading & finishing	None	All
Missouri:												
Madison	12,328	.....	.....	.....	.....	.....	.....	.....	.....	Maintenance, \$9,960; culverts, \$2,968	All	None
Miller	\$40,000	.....	.....	.....	.....	5	.....	.....	25	Maintenance	All	None

COUNTY HIGHWAY WORK DONE DURING 1919 (Continued).

State and County	Amount of county, state and federal money spent	Bitum. concrete, mi. or sq. yds.	Bitum. macad. mi. or sq. yds.	Plain macad. mi. or sq. yds.	Sand-clay, mi. or sq. yds.	Gravel, mi. or sq. yds.	Cement, concrete, mi. or sq. yds.	Brick, mi. or sq. yds.	Earth, miles or sq. yds.	Other work	Done by county or state forces	Done by contract
Montana:												
Flathead	135,718	.....	.....	.....	.....	All	.....	.....	.....	Bridges	All	None
Glacier	197,402	.....	.....	.....	.....	5	.....	.....	.....	.....	\$95,402	\$102,000
Phillips	70,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	90%	10%
Sheridan	40,000	.....	.....	.....	.....	All	.....	.....	.....	.....	70%	30%
New Jersey:												
Sussex	140,000	.....	.....	.....	.....	4	.....	.....	.....	Penetration 1, grad'g 2, repair work Bitulithic 0.73	\$110,000	\$30,000
New York:												
Oneida	195,632	.....	.....	.....	.....	.....	1.42	.....	.....	.....	None	All
North Carolina:												
Beaufort	676,000	.....	.....	.....	.....	.....	600,000	.....	.....	Maintenance roads & bridges \$76,000	None	All
North Dakota:												
Grant	40,000	.....	.....	.....	.....	.....	.....	.....	All	.....	25%	75%
Hettinger	125,000	.....	.....	.....	.....	.....	.....	.....	All	.....	16%	90%
Ohio:												
Mercer	80,000	.....	.....	.....	.....	2	1 1/2	.....	.....	.....	None	All
Oklahoma:												
Alfalfa	126,000	.....	.....	.....	.....	.....	.....	.....	175 mi.	Drain. open'gs & fills	All	None
Kiowa	58,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	6
Oregon:												
Columbia	215,592	.....	.....	.....	.....	.....	.....	.....	.....	.....	All but 5	5
Multnomah	493,995	.....	.....	.....	.....	15	9,875	.....	.....	.....	\$266,379	\$224,016
Sherman	56,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	All	None
Wheeler	500,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	\$200,000	\$200,000
South Dakota:												
Corson	51,000	.....	.....	.....	.....	.....	.....	.....	All	Elevator and Fresno work, 36	25	36
Edmunds	75,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	All	None
Yankton	116,250	.....	.....	.....	.....	10	.....	.....	.....	.....	None	All
Tennessee:												
Campbell	100,000	.....	.....	.....	.....	.....	.....	.....	8	.....	.....	All
Vermont:												
Orelans	30,000	.....	.....	.....	.....	All	.....	.....	.....	.....	.....	.....
Washington:												
Clarke	591,800	.....	.....	.....	.....	.....	1 1/2	.....	.....	.....	.....	.....
Douglas	495,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
King	1,101,857	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lewis	597,651	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
West Virginia:												
Boone	30,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Monongalia	140,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wisconsin:												
Forest	186,000	.....	.....	.....	.....	.....	.....	.....	All	.....	.....	.....
Waushara	61,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washburn	54,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Johnson	36,000	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

RESURFACING COUNTY HIGHWAYS.

State and County	Kind of pavement resurfaced.	Material used for resurfacing.	Age of old pavement.	Treatment of Old Surface Before Adding New Material.	Cost of re-surfacing per mile or sq. yd.	Use made of old materials.
Alabama:						
Madison	Gravel	Gravel	5 to 10 years	Scarifying, leveling with grader and rolling	\$0.30	.....
Illinois:						
McHenry	Gravel	Gravel screened thro 1-in. sc.	3 years	Scarified, crowned, and new material added	15.04	.....
Stephenson	Macadam	Crushed stone	15 years	.....	1.00	.....

Indiana:	Macadam	16 to 2 years	Nothing	.....
Iowa:	Macadam	12 to 20 yrs.	Nothing	.....
Clayton:	1 ml. macadam	5 years	Loose material scraped off	.....
Pocahontas:	Gravel	.....	.....	.....
Kentucky:	Gravel	6 years	Scarifier, harrowed longitudinally and reshaped with grader	3,500.00
Louisiana:	Gravel and dirt	.....	.....	.....
Avoyelles:	Shell road	2 years	Stone placed 3 ins. deep and 9 ft. wide and rolled to 2 ins. tight and covered with tar and chips	6,000.00
Mississippi:	Gravel	5-6 years	Repaired ruts and holes	75.00
Noxubee:	Gravel	3-5 years	Scarified and reshaped	.....
Montana:	Gravel	6-9 years	Spiked up with roller, new material added and rolled into place	.....
New Jersey:	Macadam	7 years	.....	15,700.00
Sussex:	{ Bit. macadam	12 years	.....	13,700.00
New York:	{ Water-bound mac.	8 years	.....	8,153.00
Onelda:	{ Gravel	.....	.....	.....
North Carolina:	Earth	.....	.....	.....
Grant:	.....	.....	.....	.....
Ohio:	Bit. macadam	3 years	.....	.....
Mercer:	Macadam	2-5 years	Scarified, new rock added and rolled	6,000.00
Oregon:	.....	1-15 years	Scarified, new rock added and rolled	3,500
Multnomah:	Gravel	1-6 years	Added gravel	75c-\$4 rod
Tennessee:	Bituminous concr.	7-9 years	.....	.....
Campbell:	{ Brick	2-7 years	.....	.....
Vermont:	{ Cement concrete	0-4 years	.....	.....
Orleans:	.....	.....	.....	.....
Washington:	.....	.....	.....	.....
King:	.....	.....	.....	.....

Board for Jurisdictional Awards in the Building Industry

Rudolph P. Miller, representing Engineering Council on the Board for Jurisdictional Awards in the Building Industry, reports that the work of this Board is proceeding most satisfactorily, and that there is a feeling, particularly among the labor unions, that its work will be very helpful in adjusting difficulties which lead to strikes. One labor representative stated at the meeting held in Washington, D. C., March 8 to 11, 1920, that the Board had accomplished in a few days what the contending organizations had failed to do in some years. At this meeting the following controversies between international unions were considered and disposed of:

1—Controversy between the Amalgamated Sheet Metal Workers' International Alliance and the United Association of Plumbers, Steam Fitters and Steam Fitters' Helpers.

2—Controversy between the United Association of Plumbers, Steam Fitters and Steam Fitters' Helpers, and the International Union of Steam Engineers.

3—Controversy between the Bridge and Structural Iron Workers' International Association and the United Association of Plumbers and Steam Fitters.

4—Controversy between Operative Plasterers and Cement Finishers' International Association and the Wood, Wire and Metal Lathers' International Union.

5—Controversy between the Amalgamated Sheet Metal Workers' International Association and the Brotherhood of Painters and Decorators.

6—Controversy between the Bridge and Structural Iron Workers' International Association and the Wood, Wire and Metal Lathers' International Union, on the placing of reinforcement for reinforced concrete, cement and floor construction. After hearing argument, it was decided "that all iron and steel used for reinforcement in reinforced concrete, cement and floor construction should be awarded to the iron workers."

Philadelphia Carpenters' Strike Settled

The strike of the carpenters and joiners in Philadelphia has been officially ended. The original compromise offer of \$1.12½ an hour having been accepted by members of the union committee. The men will receive double time for all overtime. They will not work any Saturday during July and August and they are to be off all legal holidays. A full week consists of forty-four hours.

Aside from these changes, the new agreement, which expires April 30, 1921, is the same as the 1919 agreement.

Of 1,183,000 wage-earners in Massachusetts 173,000 have an annual income of \$2,000 or more.

Decreasing Man Power

Washington statistics show that for the five months commencing last July, immigration to this country totaled 125,000 and emigration from it 144,000 showing a loss of 19,000 people. During

this period, only 1,060 Greeks landed in America and 11,500 of that nationality left America. During this period, however, 19,000 immigrants crossed the Rio Grande and only 3,000 returned over it to Mexico. The balance with England was about 17,000 in our favor.

According to an announcement by the Inter-racial Council, of New York City, 275,000 emigrants have left this country since the armistice, taking \$550,000,000 with them, while during the some period immigration has consisted largely of war widows and other women or industrial non-producers.

British Emigration Restricted

Reports from London state that the British Government is making every effort to circumscribe and direct the current of emigration so that men and women leaving Great Britain will go to the British colonies rather than to the United States.

For months past all of the American consulates in the United Kingdom have been besieged with numerous inquiries for information about the prospects in America, and there are many thousands of the British subjects that would come to the United States immediately if they were permitted to do so and could secure transportation.

Italian Immigration in 1919 and 1913.

The New York office of the Navigazione Generale Italiana and La Veloce reports on the passenger movement from Italian to United States ports that "3,374 steerage passengers have arrived by our steamers in New York since April 1; the last ship to arrive, April 16, 1920, landed 1,322 steerage passengers; 16,951 passengers landed since January 1 on the steamers under our control. The number of passengers landed in 1919 by the steamers of the Navigazione Generale Italiana and La Veloce was 12,596, while the number of passengers landed in 1913 by the steamers of the Navigazione Generale Italiana and La Veloce and Italia Line was 63,651."

Labor Shortage in New England

Reports from Boston state that the demand for help from employers during April at the public employment office on Kneeland Street shows an increase of 35 per cent over last year, also an increase of 9 per cent over March this year. The number of positions reported filed shows an increase of 45 per cent over last year and 20 per cent over March this year.

In the male skilled department machinists and helpers were most in demand, principally for arsenal work. There has been little or no call from the building trades, with the exception of painters. A number of young men are wanted for factory work, but applicants are holding off on account of the wages offered being too small.

Engineers and firemen have been in little demand, with quite a number on hand looking for work. It is usual at this time of the year to receive frequent calls for hoisting engineers on construction work, but so far this season there has been no demand. The call for clerical and mercantile help continues

to be negligible, with large numbers of applicants looking for such work.

There has been a heavy demand for able-bodied laborers both for inside and outside work, with only a fair supply of applicants. Although there has been a good demand for farmhands at wages much higher than pre-war rates, there are very few applicants for this kind of work in sight and many orders remain unfilled. The demand for boys for errands, office and factory work continues to be heavy, with a very indifferent class of applicants.

It is reported that three days after 7,000 carpenters went out on strike in Philadelphia, May 1, 3,000 returned to work on a \$60 per week wage scale granted by 119 contractors. This scale of \$1.25 per hour will yield as high as \$80 a week with overtime.

Chicago employers promised mill carpenters an increase from 85 cents to \$1.10 per hour on June 1, the workmen nevertheless went out on strike and if they remain out, will seriously cripple spring building operations by interrupting the supply of sashes, doors, blinds, window frames and trim for outside carpenters.

Trolley Strike Settled

The strike of the trolleyemen employed by the Richmond Light & Railroad Company, Staten Island, was settled by raising the minimum wage from 40 cents to 50 cents per hour, increasing to 60 cents per hour at the end of the first year. The company has claimed that it was losing money at the old scale, and has been permitted to raise fares of adults from 5 cents to 7½ cents, an amount which it is doubtful will make up the increased \$150,000 expense involved by raising the wages, especially as the fare for school children has been reduced from 4 cents to 3 cents.

Serious labor troubles in St. Paul have developed, at the last accounts, a threat of a strike of about 7,000 workers with a threat of tying up of all building operations. It is claimed that the labor unions are so fully organized that they are nearly 100 per cent efficient in that city and that 12 contractors, none of whom, however, are members of the Builders' Exchange, have acceded to the demands which include a rate of 60 cents per hour to be effected May 1 for common labor. This represents an increase of 166 2/3 per cent in five years and still falls short of the union demand, which is for an increase of 233 per cent in the same period.

A Novel Idea in Reinforcement

An original method of constructing a large reinforced concrete girder during cold weather was adopted at Toronto. The girder, which has a clear span of 51 feet and is 13 feet deep and 2 feet 2 inches wide, had two 7-inch steam pipes run through it from end to end, one 3 feet and the other 8 feet from the bottom of the girder. After the girder had set and the pipes had fulfilled their function, they were cut at the ends and left in the girder, thus forming an additional reinforcement.

Recent Legal Decisions

CONTRACT FOR PUBLIC WORKS NOT INVALID BECAUSE COST EXCEEDS ESTIMATE.

In consolidated actions by property owners to enjoin a city from proceeding under a contract for street paving, it was contended by the plaintiffs that the cost of the improvement exceeded the estimated cost, and that this was not allowable under the law. The Iowa Supreme Court, *Miller v. City of Glenwood*, 176 N. W. 373, refused to sustain this contention for the following reasons: It is quite impossible, in estimating the cost of a public work of this kind, to determine in advance the actual cost the city will incur in its completion. The estimate often proves inadequate. It is only for the purpose of advising those who may be called upon to meet the expense, when incurred, of the probable cost, as a basis for concluding whether the probable cost will exceed the probable benefits to be conferred by the improvement. If cities were to be held to a strict rule in estimating costs, it would never be safe to enter upon any scheme of public improvement. After the estimate, and before the contract is let, there may be such an increase in wages and cost of material that it would be utterly impossible to perform the work within the limits of the estimate. In the absence of fraud or collusion or something of that sort, the fact that the completed work exceeds the amount of the estimate does not leave the city without jurisdiction to assess abutting property its proportionate share, measured by the rules governing the special assessment.

CONTRACTOR'S BOND—PROTECTION OF LABORERS AND MATERIALMEN.

The Nebraska Supreme Court holds, *Nyc-Schneider-Fowler Co. v. Roeser*, 173 N. W. 605, that the state statute which requires public officials to take a bond from a contractor to pay for labor and materials used in constructing a public building is absolute, and the contract and bond will be construed to protect such laborers and materialmen if the terms of the contract and bond are ambiguous, or if they will admit of such construction.

A contract and bond "for the erection and completion of a school building" contemplates that the contractor will furnish the labor and materials, and the bond undertakes that he will do so, and, liberally construed as an attempted compliance with the statute, it includes payment by the contractor for the labor and materials.

BIDS FOR PUBLIC WORK—WITHDRAWAL.

A mistake on the part of one bidding upon public work may justify the relief in equity of the bidder from his bid, on the theory that there was no contract, and in the eye of the law no meeting of the minds. But an examination of the cases seems to indicate that relief has been granted only where there was an actual mistake in the bid itself, such that it failed to express the intention of the bidder at the time he offered it. So it is held, *Foley Contracting Corp. v. Green*, 108 Misc. (N. Y.), 520, 177 N. Y. Supp. 779, that a contractor cannot put

in a first bid merely to preserve his rights and afterwards attempt to supersede it with a higher bid on the theory of mistake.

NOTICE FOR INJURY UNDER CONTRACTORS' INDEMNITY POLICY.

Paving contractors secured from an insurance company an indemnity policy against liability for bodily injuries accidentally sustained by members of the general public in the performance of a paving contract. Two persons injured by collision with a vehicle of the contractors used on the job sued and recovered damages from the city, which obtained a judgment against the contractors, who sued the insurance company on the policy. The Michigan Supreme Court held, *Vandervliet v. Standard Acc. Ins. Co.*, 176 N. W. 574, that evidence that the insurance company had actual notice of the happening of the accident, and that it did not deny liability on the failure to give notice as required by the policy, but sent a representative to confer with the insured contractors, justified the submission to the jury of the question of estoppel of the insurer to deny notice. Assuming it intended to rely on failure to give notice, the insurance company was not justified in taking up the contractors' time to interview witnesses and obtain statements from them. An instruction to the jury that the burden was on the plaintiff to show that written notice was waived, that verbal notice had been timely given, and that the insurer waived its right to insist upon earlier notice was held warranted under these facts.

TIME FOR FILING CLAIM FOR LABOR OR MATERIAL AGAINST SURETY FOR PUBLIC WORK CONTRACTOR.

Section 77 of Massachusetts Rev. Laws, c. 6, provides that officers or agents who contract for the commonwealth for the construction or repair of a public building or other public work shall obtain security for payment by the contractor and subcontractors for labor performed and furnished and for materials used. The section also provides that a claimant for labor or material against the surety of a contractor for a public work shall file a sworn statement of his claim with the officers or agents of the commonwealth within 60 days after completion of the work. The Massachusetts Supreme Court holds, *Bay State Dredging & Contracting Co. v. W. H. Ellis & Son Co.*, 126 N. E. 468, that the "work" here refers to the public work embraced within the terms of the contract as it existed when the contractor or subcontractor was required to furnish sufficient security for the labor and material to be performed or furnished; and the right to have the benefit of the section enures to any laborer or materialman who has furnished labor or material which was used or employed in the construction or repair of the public work if he shall file a sworn statement of his claim within 60 days after the completion of the work contemplated by the original contract, even if it be not completed by the original contractor.

NEWS OF THE SOCIETIES

May 24-26.—NEW JERSEY STATE BUILDING TRADES COUNCIL. Atlantic City, N. J.

June 3-4.—NATIONAL STATE AND LOCAL ENGINEERING SOCIETIES. Organizing conference will be held at Washington, D. C.

June 16-18.—NORTH CAROLINA GOOD ROADS ASSOCIATION. Annual Convention, Asheville, N. C.

June 21-25.—AMERICAN WATER WORKS ASSOCIATION. Annual meeting, Montreal, Canada. Secretary, John M. Diven, 153 West 71st Street, New York City.

June 22-25.—AMERICAN SOCIETY FOR TESTING MATERIALS. Asbury Park, N. J. Office of secretary, Philadelphia.

June 22. JOINT COMMITTEE ON STANDARD SPECIFICATIONS FOR CONCRETE AND REINFORCED CONCRETE. Next meeting at Asbury Park. Secretary-treasurer, D. A. Abrams, Lewis Institute, Chicago.

Aug. 30-Sept. 2.—AMERICAN PUBLIC HEALTH ASSOCIATION. San Francisco. Office of secretary, Boston.

Sept. 13-17.—AMERICAN PUBLIC HEALTH ASSOCIATION. Boston, Massachusetts.

Oct. 12-14.—AMERICAN SOCIETY FOR MUNICIPAL IMPROVEMENTS. Annual convention, St. Louis, Mo. Secretary, Charles Carroll Brown, 401 Lincoln avenue, Valparaiso, Ind.

League of Texas Municipalities.

The eighth annual convention of the League of Texas Municipalities was held in the City Hall Auditorium, Dallas, Texas, on May 13, 14 and 15. The officers of the league are: President, Mayor Frank W. Wozencraft, Dallas; Vice-presidents, Mayor W. J. Nichols, Texarkana; City Manager E. L. Wells, Jr., San Angelo; City Attorney J. B. Rector, Austin; Secretary-treasurer, Frank M. Stewart, Austin. Secretariat, Bureau of Government Research, University of Texas, Frank M. Stewart, secretary; Mrs. Sarah S. Edwards, reference assistant; John R. Anthony, research assistant; Wm. B. Ball, research assistant; Robert D. Jackson, assistant.

The annual membership dues for active members are: Cities less than 5,000 population, \$5; 5,000 to 15,000 population, \$10; 15,000 to 25,000 population, \$15; 25,000 to 50,000 population, \$20; 50,000 to 100,000, \$25; over 100,000 population, \$30. Associate members, \$1.

The convention held six public sessions and one executive session, were the mayor's guests at dinner, and made an automobile excursion through the city and to points of interest. The principal papers presented included: City Purchasing; The City Manager Plan; Municipal Bonds and Bond Issues; Municipal Taxation and Revenues; Municipal Taxation; Paving Street Maintenance; Municipal Forestry; City Planning—addresses by George E. Kessier and Robert H. Whitten,

city planning experts, St. Louis, Mo.; Public Utility Regulation; Report of Public Utilities Committee of Seven (discussion of report); Sewerage Systems and Disposal Plants; Water Plant Construction and Operation; Malaria and Mosquito Control; Organization of City Health Department; Pure Food Regulations; Pure Water Supply for a City; Municipal Markets and Reduction of Living Cost; Municipal Welfare Department.

Chamber of Commerce of the United States.

At the eighth annual meeting of the Chamber of Commerce of the United States, held in Atlantic City, April 26-29, in connection with a meeting of the National Counsellors of the Chamber and a meeting of the National Association of Organization of Secretaries, there was a very large attendance of distinguished representatives from all parts of the United States, and the important list of vital subjects considered included Increased Production, International Finance, Transportation, Foreign Commerce, Cost Accounting, Domestic Distribution, Insurance, Civic Development, International Chamber of Commerce, The Business Press, The Government and Production, Labor, Agriculture, and Industrial Production.

The subject of transportation and its relation to increased production was taken up in all its phases. One group gave its attention to railroads, another to shipping and a third to highways and motor transportation. The railroad group heard the report of the Railroad Committee of the National Chamber, which set forth facts with reference to recent railroad legislation and the present situation of the rail lines. It heard George A. Post, president of the Standard Coupler Company, of New York; John E. Oldham, of Boston, and Charles E. Lee, transportation engineer, of New York.

Civic Development occupied a group under chairman R. G. Rhett, president of the Peoples National Bank, Charleston, S. C. Leaders in the discussion were George M. Verity, president of the Middletown, Ohio, Chamber of Commerce; James T. Lloyd, of the Washington, D. C., Chamber of Commerce, and Mrs. Sophie E. Delavan, president of the Woman's Association of Commerce, of Chicago.

Labor in Relation to Production was a subject treated from the standpoint of the employer and the employee. Labor's view was pre-

sented by Matthew Woll, vice-president and member of the executive council of the American Federation of Labor. The employer's viewpoint was advanced by John W. O'Leary, of the Chicago Trust Co. Another speaker was Gov. Allen, of Kansas, who explained the workings of the new Kansas Industrial Court.

A group session was held to crystallize an American viewpoint on questions that will come before the first meeting of the International Chamber of Commerce, which will be held in Paris, France, during the week of June 21 and will be attended by more than 100 American delegates.

It was announced that \$2,750,000 has been subscribed or pledged for a new home for the United Chamber of Commerce.

Important resolutions were passed on Increased Production, Peace Treaty; Government and Business, American Institution, Agriculture, Railroads, Merchant Marine, Waterways, Traction Service, Fire Prevention, Governmental Co-operation, War Plans and Equipment, Damages by Government Agencies, Department of Commerce, National Budgets, Taxation, Preparation for Emergencies, Union Chamber of Commerce, and various other subjects.

Resolutions were also recommended to the Board of Directors on Anti-Trust Laws, Business Codes, Cost Accounting, Foreign Trade Policies, Government Foreign Service, Highways, Industrial Courts, Methods of Determining Capital, Public Service Corporations, Selling Prices Fixed by Labor, and various other subjects.

There were elected the following officers: President, Joseph H. De-frees; senior council, Harry A. Wheeler, John H. Fahey, R. G. Rhett, Homer L. Ferguson, and Wallace D. Simmons. For vice-presidents: A. C. Bedford, Wm. Butterworth, Philip S. Tuley, Maynard McFie. For honorary vice-presidents, A. B. Farquhar, Charles A. Nagel, L. S. Gillette. Treasurer, John Joy Edson, and thirty directors from the principal cities throughout the United States.

League of the Southwest.

At the three day session in Los Angeles, last April, of the League of the Southwest, the governors of five states and delegates from all parts of the Colorado River Basin were present and resolutions were adopted to promote the wide development of Colorado River storage and power. Congress was requested to appropriate \$50,000 to complete investigations of the Boulders Canyon Reservoir site.

Seventh Annual Trade Convention.

The seventh annual convention, held in San Francisco May 10, was attended by more than 2,000 financial and trade experts. The sentiment of the meeting was strong for the necessity for promoting and increasing foreign trade, and James S. Farrell, of the Steel Corporation, asserted that our productions will be greater than our home consumption and in order to maintain them, they must have foreign outlets. Fred J. Kent, member of the financial committee of the Inter-Allied Preparation Commission, asserted that no government has returned to orderly operations since the war, and that foreign exchanged cannot be stabilized until railroads, shipping, building construction, and all industries are returned to normal conditions, for which maximum efficiency and orderly labor conditions are necessary.

American Water Works Association.

The California section of the American Water Works Association, organized in San Francisco April 20, elected as officers: Chairman, George A. Elliott, chief engineer Spring Valley Water Company; vice-chairman, Charles G. Hyde, professor of sanitary engineering, University of California, and secretary-treasurer, George W. Pracy, superintendent Spring Valley Water Company.

International Association of Fire Engineers.

At a directors' meeting held in Toronto, Canada, March 24, it was decided to hold the next annual convention in the Toronto Exhibition Park, July 26-30. At this convention there will be held a memorial service in the convention hall. Reports of committees and other routine business will be conducted, and discussion will be held on standards, previously printed and distributed to the members. Addresses, papers and discussions will be presented on Organization and Supervision; Organization and Strength of Companies; Fire Department Engineering, including apparatus and minor equipment; Drill Schools, Drills and Training; Discussion of Fire Manual; Building Inspection by Uniformed Members of Fire Departments; Location, Design and Construction of Apparatus Houses; Regulations and Discipline; Water Supply High Pressure System, and Operations of High Pressure Streams. Discussion is important and is especially invited on these reports, particularly that on Fire Department Engineering and Minor Equipment, and on Fire Extinguishers and Fire Prevention.

Acknowledgment was made of an invitation to hold the 1921 convention in Savannah.

It was pointed out that the fire waste in this country is between \$250,000,000 and \$300,000,000 annually, and that between 7,000 and 10,000 people perish by fire each year in North America.

American Railway Engineering Association Elected a Member of Engineering Council.

In accordance with the proposal of chairman J. Parke Channing in a communication to the United Engineering Society dated March 19, 1920, and with the unanimous approval of the representatives of the Founder Societies in Engineering Council, it was voted at the regular meeting of the trustees of United Engineering Society on March 25, 1920, as follows:

"That the American Railway Engineering Association be invited and elected to membership in Engineering Council, subject to the unanimous approval of the governing bodies of the four Founder Societies, and that upon receipt by the secretary of information of such approval, the invitation be extended to said association to become a member of Engineering Council, upon acceptance of the invitation and compliance with the requirements of the Rules for Admission of Additional Societies."

The American Railway Engineering and Maintenance of Way Association was organized in 1899 with the object of "the advancement of knowledge pertaining to the scientific and economical location, construction, operation and maintenance of railroads"; the name was changed in 1911 to its present form and the association now has about 1,640 members. The president is H. R. Safford, M. Am. Soc. C. E., assistant to president of Chicago, Burlington & Quincy Railroad, and the secretary is E. H. Fritch, 431 South Dearborn street, Chicago, Ill.

The Detroit Engineering Society.

The Detroit Engineering Society has voted to join the federation of engineering bodies outlined in the report of the joint conference committee of the National Engineering Society.

The Raleigh (N. C.) Engineering Society.

This society, organized April 19, has elected as officers: W. B. Henderlite, president; W. Z. Betts, secretary-treasurer, and L. B. Denmark, chairman of committee on membership and publicity.

PERSONALS

Fellows, A. L., has been placed in United States Office of Public Roads.

Sears, S. P., assistant engineer, division of irrigation investigations, charge of the Denver office of the Hartford Water Department, has accepted a position with C. W. Blakeslee & Sons, New Haven, Conn.

Murphy, L. G., has accepted a position with the Foundation Company, New York.

Saville, Thorndyke, professor of hydraulic and sanitary engineering at the University of North Carolina, has been appointed hydraulic engineer for the North Carolina Geologic and Economic Survey in charge of an investigation of water resources of North Carolina.

Schwab, J. C., has been appointed city engineer of Alton, Ill.

Nelson, W. H., has been elected engineer of Smith County, Kansas.

Russel, G. A., has been elected engineer of Geary County, Kansas.

Rumberger, H. K., Bellingham, Wash., has been appointed city engineer of Ferndale, Wash. Okla.

Victoreen, C. J., has been appointed city engineer of Cabiz, Ohio.

Wood, C. W., has been appointed chief engineer of the South San Joaquin Irrigation District, California.

Clark, B. E., has been appointed district engineer at McAlester, Okla.

Ramsey, E. K., has been appointed district engineer at Oklahoma City, Okla.

Forde, L. K., has been appointed district engineer at Cherokee, Okla.

Hunt, C. F., has been appointed village engineer of Endicott, N. Y.

Schark, Frank, Jr., has been appointed to the Missouri State Highway Department at Jefferson City, Mo.

Stevens, J. H., has been appointed village engineer, Massena, N. Y.

Preston, J. O., has become assistant engineer to I. K. Davis Company, contractors of engineers, Philadelphia.

O'Brien, F. E., has been appointed assistant city engineer of Watertown, N. Y.

Gould, A. G., has been appointed chief engineer of the H. Denburger Contracting Company, Bethlehem, Pa.

Elliott, W. R., has resigned as chief engineer of the Sault River Valley Water Users' Association, Arizona, and established an independent engineering practice.

Eichelberger, F. O., city engineer of Dayton, Ohio, has been appointed Director of Public Service.

New Appliances

Describing New Machinery, Apparatus, Materials and Methods and Recent Interesting Installations.

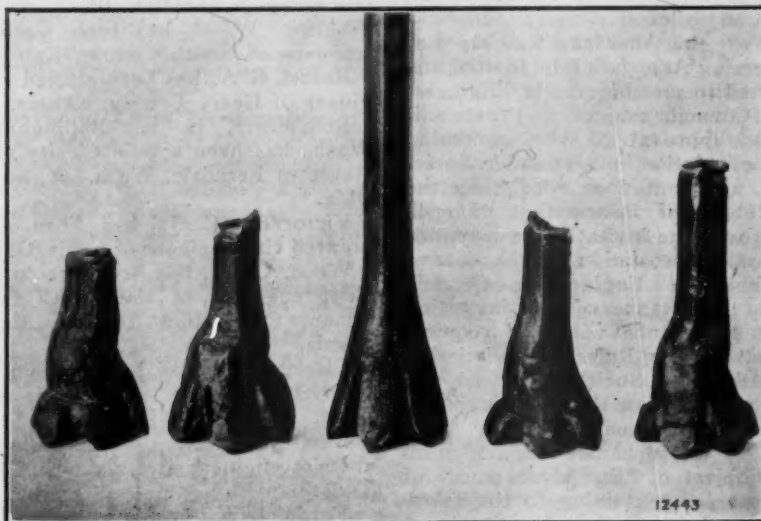
IMPORTANCE OF GOOD DRILL SHARPENING.

Success in rock drilling is almost entirely dependent on the care and judgment used by the blacksmith in turning out good steels. The drill steel sharpeners turned out by manufacturers of rock drilling machinery has gone a long way towards making this possible, but they cannot eliminate the personal equation of the blacksmith.

One of the largest manufacturers of the rock drilling machinery not long ago had a complaint that one of its jackhammers was falling down on the job. In the customer's own

words, "The drill didn't have any pep." Investigation showed the actual condition of the bits that were being used accounted for the results. The bit shown in the center was made by the manufacturers' representative with the same machine as the other four bits shown, demonstrating clearly that it was not the fault of the sharpening machine. Is it any wonder that the jackhammer didn't have any pep?

It is found that a large number of drill complaints can be traced directly to bad blacksmithing, against which the manufacturers are waging a continual campaign of education.



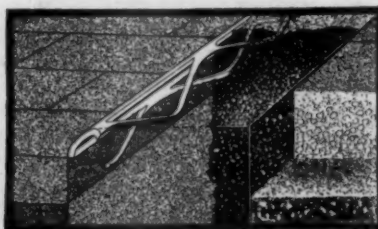
DRILL BITS SHARPENED PROPERLY AND IMPROPERLY BY SKILLED AND UNSKILLED OPERATION OF SAME MACHINE.

NATIONAL CURB (BAR) REINFORCEMENT.

National curb (bar) reinforcement manufactured by the National Steel Fabric Company, is built into the upper exposed corner of a concrete curb in such a manner as to protect the latter from abrasion, impact, cracks, or expansion openings and to present a strong, symmetrical curved bearing surface with an attractive finish. It also serves as an efficient reinforcement for the curb slab itself and gives it additional durability.

The curb bar is a quadrant segment of a hollow cylinder with the upper and lower edges tangent to the face and top of the curb, thus forming a smooth round corner continuous with the vertical and horizontal concrete surfaces. On each edge the metal, in fabrication, is detached from the main body of the bar in long, narrow strips that

are separated from it except at the end and are bent inwards, deflected from the surface of the concrete



CURB BAR IN POSITION, SHOWING REINFORCEMENT ANCHORAGE.

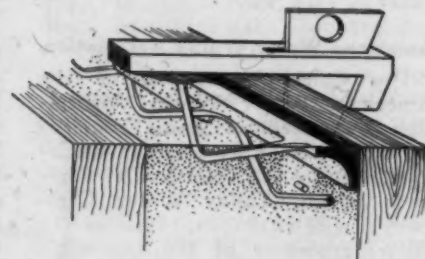
so as to form loops embedded in the concrete and serving as thoroughly efficient anchors to hold the bar exactly in place and providing steel reinforcement for the concrete. They give transverse as well as longitudinal strength, increasing the bending, shearing and tensile efficiency of the curb. Their continu-

ity and interlocking effect prevent the possibility of wedge action which might divide or split the concrete.

This device is used not only for sidewalk and pavement curbs, but also for the edges of railroad platforms, warehouse platforms, concrete columns, and, in fact, to protect almost any concrete corner that is exposed to injury in service.

It is manufactured from new billet steel and heavily galvanized after fabrication. It is furnished either in straight lengths or curved to a required radius.

In order to facilitate its accurate and convenient use, the curb rein-



CURB BAR ATTACHED TO WOOD FORM WITH CLAMP.

forcement can be provided with National Curb Bar Clamps, suitable for attaching it to wood forms from 1½ inches to 2½ inches in thickness, and which can be used over and over again, quickly eliminating the first cost. The clamp holds the bars to the forms at the exact required angle until the concrete has sufficiently set, when the clamp is removed and the ½-inch hole that it leaves is filled with mortar. The clamp is easily attached and detached by means of a tapered key, and no screws, bolts, or other fastenings are required for it.

Ransome Product in Atlanta

Hereafter Ransome concrete machinery in the Atlanta territory will be sold by W. F. Goodrich & Bro., with offices at 10¼ Auburn avenue, Atlanta, Ga. For several years W. F. Goodrich has been connected with the Ransome line in this territory. He has recently severed his connection as president of the Piedmont Motor & Machinery Co. and has gone in business for himself with his brother, James Goodrich, who is an experienced engineer. In addition to the Ransome line, they will handle general equipment such as hoisting engines, crushers, forms, etc.